

## Note on an Amœba-like Parasite from Clavellina.

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With 1 Text-figure.

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In the summer of 1910 at Naples I noticed that the stomach of small (and therefore semi-transparent) individuals of the social Ascidian, *Clavellina lepadiformis*, sometimes contained a number of solid objects. When this was so it was obvious, because the ciliary action in the stomach kept these objects in constant and rapid motion.

On investigation the objects in question proved to be small parasitic amœbæ, of a species which does not appear to have been previously described. It is proposed to give it the name *Amœba clavellinæ*.

**General Description.**—The amœbæ are rather small, the average diameter being 14–15  $\mu$ , with occasional giants of 18–17  $\mu$  and a few considerably smaller of 11–12  $\mu$  diameter. They were usually subspherical, but occasionally ovoid, the long diameter then averaging 17–18  $\mu$ . As they appear never to adhere to the walls of the stomach, but to be whirled about passively in the nutritive fluid of the lumen, we should not expect to find any great development of pseudopodia; and, as a matter of fact, these were never observed. I did not notice anything but the mildest irregularities of contour, and even the change to the ovoid shape was exceptional.

**Cytoplasm.**—In one respect this amœba is remarkable. Although in perhaps the majority of specimens there is a definite ectoplasm, marked off from the endoplasm by a definite sharp contour (Text-fig. A and B), yet in some there may be no ectoplasm whatever, the darker, densely granular and more refringent endoplasm coming right up to the edge of the cell. A few specimens are intermediate, in that, although both layers are present, there is no sharp demarcation between them; and one of this type was seen in which the ectoplasm was absent over *part* of the body. The endoplasm appears practically homogeneous in ground-substance, with quite large, round or ovoid granules scattered through it. No contractile vacuole was observed. In one stained specimen a vague, somewhat clearer space was seen close to the nucleus.

**Nucleus.**—This was almost always rather excentric in position. It was almost spherical, varying in diameter from about 4 to 5  $\mu$ , while the nucleolus, as I shall call the central body, varied from 2 to 2 $\frac{3}{4}$   $\mu$  in long diameter, being often rather more ovoid than the nucleus itself.

The nucleus, like the cytoplasm, varied considerably in structure. The following may be taken as its typical plan (see Text-fig. c, as an example): On the outside there is a definite, double-contoured, dark-staining nuclear membrane (*nu.m.*) Next comes a clear ring, which I shall call the first clear band, or, for brevity's sake, *c. 1*; then another dark band, usually thicker than the nuclear membrane—the granular band (*gr.b.*); then a second clear band (*c. 2*); and finally, a large dark nucleolus (*ncl.*), with a sharp edge, usually containing one or more clearer spaces towards its centre.

In the commonest form the granular band is fairly sharply defined, composed of very fine granules, and uniform in thickness (and about twice as thick as the nuclear membrane), while the clear bands are quite clear and do not take up staining reagents. Each is about as thick as the nuclear membrane. The nuclear membrane usually stains deepest, then the nucleolus, then the granular band.

The following variations may occur, while the general

type is preserved. The granular band varies—(1) In size: it may be only as thick as the nuclear membrane, or up to nearly three times as thick. (2) In consistency: sometimes it appears absolutely structureless (Text-fig. c), sometimes homogeneously granular, the granules of various degrees of coarseness; sometimes it loses its homogeneous character,

TEXT-FIG.

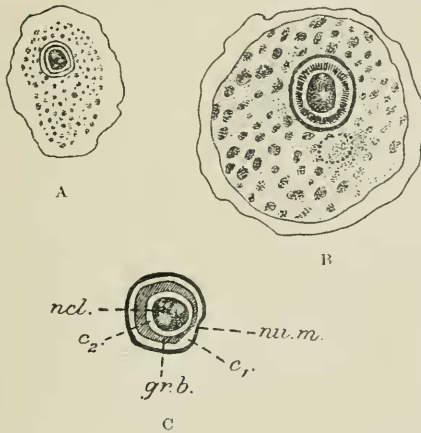


FIG. A.—An amœba with broad, clearly-defined ectoplasm. Nucleus of typical plan, with very thin granular band. Some clearer ovoid spaces in the nucleolus. The animal has elongated to an oval shape. FIG. B.—Amœba with thinner but very sharply marked-off ectoplasm. Nucleus of typical plan, the granular band of medium breadth, finely grained. One vague clear space in the nucleolus. FIG. C.—Nucleus of another specimen. *ncl.* the nucleolus; *nu.m.* the nuclear membrane; *c. 1* and *c. 2* very clear; the “granular band” (*gr.b.*) quite homogeneous, thin at one side. Two round clear spaces in the nucleolus.

consisting either of a faint structureless ground-substance with scattered dark granules embedded in it, or broken up altogether into more or less irregular large lumps. (3) In shape, being sometimes very thick in one part, and so resembling a signet-ring.

There are further variations in the staining properties of the nucleus. The relative tingibility of the parts is usually

retained, although occasionally the granular band exceeds the nucleolus in depth of staining; but occasionally either the nucleolus or the granular band (or both) is exceptionally pale.

The other main type of nucleus differs in possessing no outer clear band, the granular band being broader and coming right up to the membrane. Intermediate forms, however, exist, since stages in the differentiation of the clear band can be distinctly seen. In some specimens there is no indication of it whatever, the broad granular band being homogeneous in texture throughout its breadth. In other specimens the granular band is structureless and rather pale, with a row of few and small granules round its inner edge. In others these granules are more numerous, in others, again, larger. Finally one specimen was seen in which the typical plan was completely realised, save that the outer clear band was just faintly tinged with the stain.

What the meaning of these variations may be is at present quite uncertain. In two specimens no trace of a nucleus could be seen; whether the chromatin was in the form of chromidia, and lost to view among the cytoplasmic granules, could not be ascertained.

**Habitat and Life-history.**—I never saw the amœba anywhere save in the stomach of the ascidian. No cysts were ever observed, nor any indications as to further stages in the life-history. They presumably divide by binary fission in this vegetative stage, as is indicated by this difference in size, but no mitotic figures were ever observed. Although I had been working at *Clavellina* since January, I did not notice the amœbæ until April. Whether this was merely an oversight, or related to some fact of their life-history, I cannot say. The amœbæ may be so numerous as almost to fill the stomach.

In one respect the parasite is very remarkable—in the incessant and very speedy motion in which it spends the whole of its vegetative existence.

The life-histories of amœbæ are none too well known, of

marine Amœbæ especially so. I have not the opportunity myself of continuing my observations, and am therefore publishing these fragmentary notes in the hope that some protozoologist may thereby be incited to attack the problem of the life-history of amœba in a parasitic form which not only inhabits a common and easily-kept host, but has the rare property of being visible, *in vivo*, in its natural habitat.

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